

# Effect of a Safety-Engineered Phlebotomy Device on Activation Compliance and Sharps Injury

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## Abstract

**Background:** 400,000 percutaneous injuries (PI) occur in US hospital workers yearly, resulting in potential transmission of bloodborne pathogens and significant cost.

**Objective:** Determine the effect of a safety-engineered blood collection set on safety-feature activation and PIs.

**Methods:** In July 2005, device (A): BD Vacutainer® Push-Button Blood Collection Set (Becton, Dickinson and Company, Franklin Lakes, NJ) replaced device (B): Punctur-Guard® Winged Blood Collection Set (Bio-Plexus, Vernon, CT). Safety feature activation was assessed by examination of sharps disposal boxes content at baseline, 30 d, 90 d, 180 d, and 360 d following device introduction. A confidential survey administered to phlebotomists at baseline and 90 days after introduction of device A was performed to assess attitudes regarding safety-engineered devices and PI reporting. PIs were monitored by the Employee Health Dept.

**Results:** At baseline, the activation rate for device B was 74.3% (371/499) and was 87.8% (396/451), 96.8% (456/471), 95.7% (627/655), and 97.6% (601/616) at 30 d, 90 d, 180 d, and 360 d, respectively for device A ( $p < 0.1$  at each time point relative to device B at baseline). 58 (97%) phlebotomists completed the baseline survey. Four (7%) had experienced a PI in the past 12 months and 100% indicated that they had reported the PI. 47% experienced a total of 1-5 PIs ever while working as a phlebotomist and 52% reported no previous PIs. PI was significantly associated with age ( $p = 0.009$ ) and number of years as a phlebotomist ( $p=0.002$ ). 96% believed that safety-engineered devices reduced the risk of PI and 89% reported always activating the safety feature. Three months following device A introduction, 61 (100%) phlebotomists completed the post-introduction survey, 95% indicated satisfaction with device A, and 97% indicated that the safety feature was easier to activate than device B. The rate of all PIs (injuries per 100,000 hours worked) remained constant following adoption of device A (mean  $1.27 \pm 0.19$  to  $1.24 \pm 0.11$ ,  $p = 0.6$ ). The rate of PI associated with phlebotomy decreased following adoption of device A (mean  $0.26 \pm 0.1$  to  $0.08 \pm 0.04$ ,  $p = 0.02$ ). However, the rate of PI specifically reported to involve butterfly needles did not change substantially (mean  $0.11 \pm 0.065$  vs  $0.09 \pm 0.057$ ,  $p = 0.5$ ).

**Conclusions:** Device A was well accepted and safety feature activation was judged to be easier. Safety feature activation increased after introduction of device A and was sustained for 12 months. PIs associated with phlebotomy decreased after introduction of device A. PIs specifically noted to involve butterfly needles did not change appreciably, but limited statistical power precludes a conclusion regarding the impact of device A on butterfly needle associated PIs.

## Introduction

Approximately 400,000 percutaneous injuries (PIs) involving potentially contaminated sharps occur in United States hospital workers yearly [1]. PIs result in potential transmission of bloodborne pathogens which is associated with significant cost and substantial worker anxiety [2, 3]. Recognition of the risks associated with PIs in healthcare workers resulted in the passage of the Needlestick Safety and Prevention Act of 2000 [4, 5] which mandates that institutions "implement appropriate safer medical devices."

The purpose of this project was to determine the effect of a safety-engineered blood collection set on safety feature activation and PI and to assess phlebotomist's knowledge and attitudes toward PIs and safety-engineered devices.

## Methods and Materials

**Devices and Timing of Use:** In July 2005, device A: BD Vacutainer® Push-Button Blood Collection Set (Becton, Dickinson and Company, Franklin Lakes, NJ) (Figure 1) replaced device B: Punctur-Guard® Winged Blood Collection Set (Bio-Plexus, Vernon, CT).

**Safety Feature Activation Assessment:** Sharps disposal boxes were collected from 5 locations and their contents were examined and cataloged at 5 timepoints: baseline (pre-introduction of device A) and 30 days, 90 days, 180 days, and 360 days post-introduction of device A.

**Phlebotomist Survey:** In order to assess healthcare worker knowledge and attitudes regarding PIs and safety-engineered devices, a confidential survey was administered to phlebotomists granting informed consent, prior to the introduction of device A and 90 days post introduction of device A. Information gathered included demographic data, PI history, and opinions regarding PI risk and safety-engineered devices.

**Percutaneous Injury Monitoring:** PIs were monitored through a pager system (888-OUCH pager) maintained by the Employee Health Department.

**Statistical Analysis:** Safety feature activation rates were compared at each time point relative to the baseline rate using the Wilcoxon Signed-Rank test. Fisher's Exact Test was used to make comparisons between groups responding to the phlebotomist's survey. The post adoption PI rate was compared to the pre-adoption PI rate using one-tailed exact Poisson probabilities.

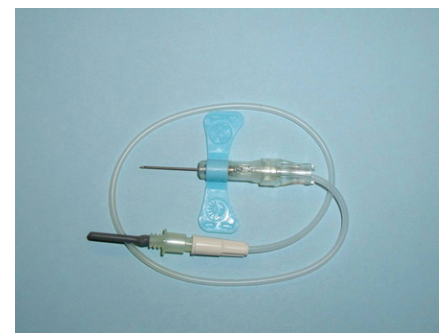


Figure 1. Device A: BD Vacutainer® Push-Button Blood Collection Set

## Results

### Employee Survey

58 (97%) phlebotomists completed the baseline survey and 61(100%) completed the 90 day survey. Four (7%) had experienced a PI in the past 12 months and 100% indicated that they had reported the PI. 47% experienced a total of 1-5 PIs ever while working as a phlebotomist and 52% reported no previous PIs. PI was significantly associated with age ( $p = 0.009$ ) and number of years as a phlebotomist ( $p=0.002$ ). 96% believed that safety-engineered devices reduced the risk of PI and 89% reported always activating the safety feature. Ninety days following device A introduction, 95% indicated satisfaction with the device, and 97% indicated that the safety feature was easier to activate than device B.

## Results (cont)

### Device Utilization

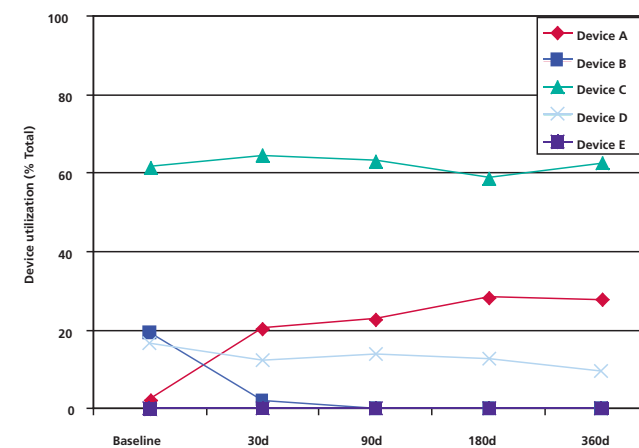


Figure 2. Device Utilization. The percentage of various devices found in the sharps disposal boxes is illustrated. Following introduction of Device A (BD Vacutainer® Push-Button Blood Collection Set), it accounted for 20.6% to 28.5% of all devices utilized. Other devices consisted of: Device B: Punctur-Guard® Winged Blood Collection Set; Device C: BD Vacutainer® Eclipse™ Blood Collection Needle (Becton, Dickinson and Company, Franklin Lakes, NJ); Device D: Monoject Magellan® Safety Needle (Tyco Healthcare, Mansfield, MA); Device E: Pro-Vent® Plus Arterial Blood Sampling Kit (Smiths Medical, Keene, NH). The total numbers of devices counted are as follows: baseline (N = 2586), 30 day (N = 2185), 90 day (N = 2059), 180 day (N = 2300), 360 day (N = 2208).

### Safety Feature Activation

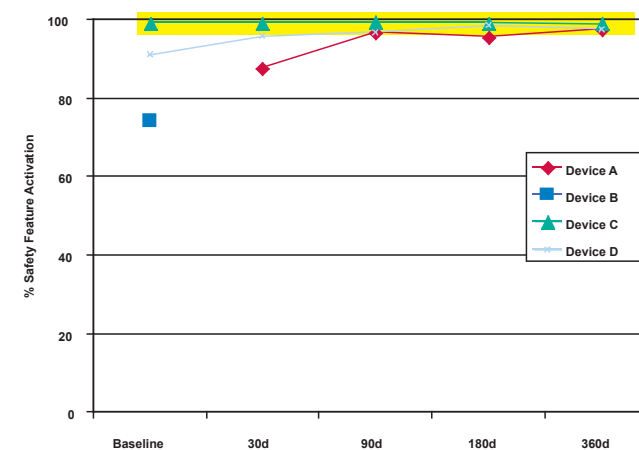
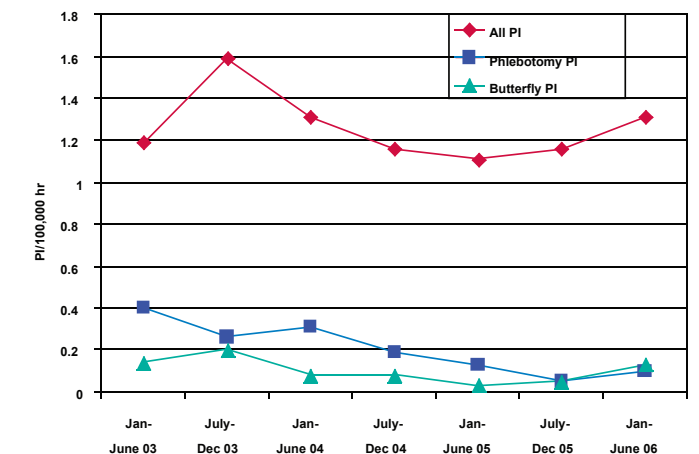


Figure 3. Device Safety Feature Activation. The percentage of the various devices recovered from the sharps disposal boxes with the safety feature activated is illustrated. The baseline activation rate for device B (Punctur-Guard® Winged Blood Collection Set) was 74.3%. Following introduction of Device A (BD Vacutainer® Push-Button Blood Collection Set), the activation rate was 87.8%, 96.8%, 95.7%, and 97.6% at 30 days, 90 days, 180 days, and 360 days, respectively ( $p < 0.1$  at each timepoint relative to device B at baseline). Other devices consisted of: Device C: BD Vacutainer® Eclipse™ Blood Collection Needle (Becton, Dickinson and Company, Franklin Lakes, NJ); and Device D: Monoject Magellan® Safety Needle (Tyco Healthcare, Mansfield, MA). Device E (Pro-Vent® Plus Arterial Blood Sampling Kit) accounted for only 16 devices over the 12 month study period and data are not shown.

### Percutaneous Injuries:

The rate of all PIs (injuries per 100,000 hours worked) remained constant following adoption of device A (mean  $1.27 \pm 0.19$  to  $1.24 \pm 0.11$ ,  $p = 0.6$ ). The rate of PI associated with phlebotomy decreased following adoption of device A (mean  $0.26 \pm 0.1$  to  $0.08 \pm 0.04$ ,  $p = 0.02$ ). However, the rate of PI specifically reported to involve butterfly needles did not change substantially (mean  $0.11 \pm 0.065$  vs  $0.09 \pm 0.057$ ,  $p = 0.5$ ) (Figure 4).

Figure 4. Rate of percutaneous injuries (PI)



## Conclusions

1. The BD Vacutainer® Push-Button Blood collection Set (Device A) was well accepted.
2. Safety feature activation of Device A was judged to be easier than a comparable device by phlebotomists and safety feature activation increased after Device A was introduced.
3. Safety feature activation of Device A was well-maintained for 12 months post introduction
4. PIs associated with phlebotomy continued to decrease after introduction of Device A, but PIs noted to involve butterfly needles did not change appreciably.
5. Limited statistical power precludes conclusions regarding the impact of device A on PI.

## References

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